REMARKS/ARGUMENTS

Reconsideration is respectfully requested.

Claims 1, 3 and 8 are pending before this amendment. By the present amendment, new claims 21-26 have been added. No new matter has been added.

Amendments to the Drawings

The amendments to the Figs 1, 10 and 13 are supported in the specification since the page 7 of the specification recites that the transmit mixer 210 mixes a base band signal outputted from the base band processor 330 and the resonant frequency f_{LO} outputted from the VCO 130 to convert the base band signal into an RF signal and Figs. 11, 12, 14 and 15 show that the output resonant frequency f_{LO} is provided into the receive mixer and the transmit mixer.

The amendments to the Figs. 1, 2, 3, 10 and 13 are supported in the specification since Figs. 11, 12, 14 and 15 show that the signal outputted by the VCO is provided into the frequency synthesizer.

In the office action (page 2), claims 1, 3 and 8 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Publication No. 2004/0048591 (Kim) in view of U.S. Publication No. 20030119467 (Welland). The "et al." suffixes are omitted from the Kim and Welland reference names.

The applicants disagree and submit that the claims, as they now stand, are in condition for allowance.

In accordance with the present invention of claim 1, the RF front-end transceiver includes:

> a frequency synthesizer or a base band processor for providing a digital frequency control voltage (VDT) signal and an analog frequency control voltage (VAT) signal;
>
> an oscillator for outputting a resonant frequency signal such that a frequency of the resonant frequency signal is controlled by the VDT signal and the VAT signal;
>
> a receive amplifier for amplifying and outputting a receive RF

signal;

a receive mixer for mixing the receive RF signal amplified and the resonant frequency signal to convert the receive RF signal into a receive base band signal;

a transmit mixer for mixing a transmit base band signal and the resonant frequency signal to convert the transmit base band signal into a transmit RF signal; and

a transmit amplifier for amplifying and outputting the transmit RF signal,

wherein at least one of the receive amplifier, the receive mixer, the transmit mixer and the transmit amplifier includes a resonant unit, the resonant unit being controlled by only the VDT signal or by both the VDT signal and the VAT signal.

That is, in accordance with the present invention, one of the receive amplifier, the receive mixer, the transmit mixer and the transmit amplifier is controlled by only the VDT signal or both the VDT signal and the VAT signal from the frequency synthesizer, the VDT signal and the VAT signal being used to control the oscillator.

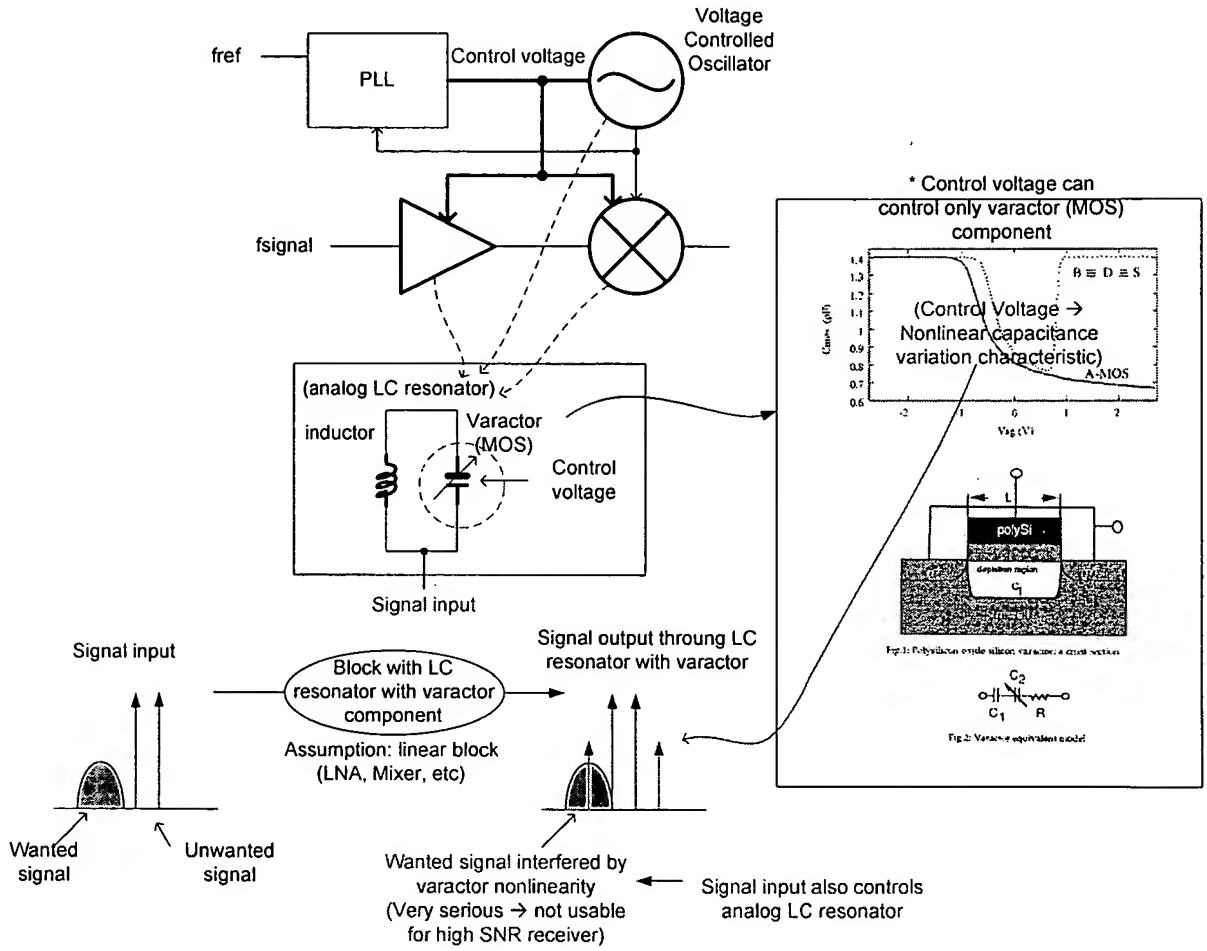
The Office Action stated that Welland disclose the oscillator which is a digital analog tuning voltage controlled oscillator for providing the output resonant frequency, VCO being controlled by VAT and VDT signals, and that it would have been obvious to one of ordinary skills to modify the PLL of Kim to include the frequency synthesizer as disclosed by Welland et al, in page 4.

However, it is respectfully traversed as followings.

According to Kim, when the signal having the frequency of fsignal passes through the analog LC resonator, the signal is distorted by the nonlinear capacitance variation characteristic of the Varactor. Thereby, it is difficult to get high SNR.

This is because, in Kim, only control voltage which is an analog signal is used to control a LNA (low noise amplifier) and a down mixer. Accordingly, the Varactor should be used in the LC resonator of the LNA and the down mixer because only analog signal is used. And, the Varactor receives a signal input as well as the control voltage, and according to the magnitude of the signal input, the capacitance of the Varacotr is changed, thereby, increasing the Varactor's nonlinear characteristic. And this characteristic increases distortion of the signal.

The below figure is a graph to explain the above problem. It is assumed that other characteristics of the LNA and the Mixer in the graph have linearity in order to explain the problem of the analog voltage control.



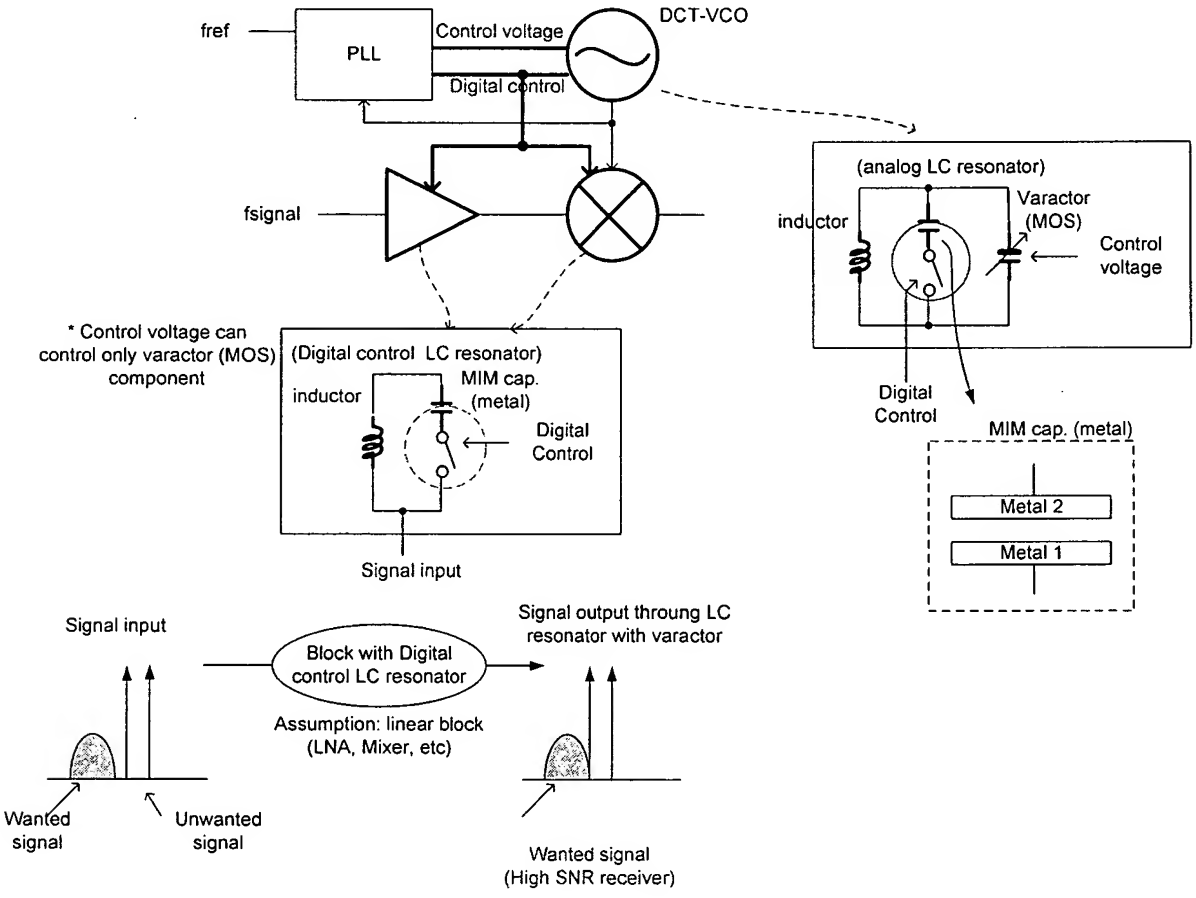
On the other hand, in accordance with the present invention, one of the receive amplifier and the receive mixer has the resonant unit controlled by only the VDT signal or by both the VDT signal and the VAT signal.

When the signal having the frequency of fsignal passes through the receive amplifier or the receive mixer of the present invention, the signal is far less distorted than those of Kim, because the LC resonator is controlled by a digital signal. The transceiver of the present invention can decrease the signal distortion to level of a transceiver which does not use the control signal from PLL whereas Kim has problem in

the signal distortion. That is, the present invention has unexpected technical advantage the cited references do not teach and disclose.

And, because, when both the VDT and VAT signal are used to control, the varactor can be smaller than the varactor controlled by only the analog signal, the RF front-end transceiver according to the present invention can be designed with a significantly reduced area, so that it is very competitive with respect to the costs.

The below figure is a graph to explain the above technical feature. It is assumed that other characteristics of the LNA and the Mixer in the graph have linearity in order to explain the problem of the analog voltage control.



Welland only discloses the VCO which is controlled by VAT and VDT signals, but does not disclose and teach that the receive amplifier or the receive mixer is controlled by the VAT and VDT signal which are control signals from the frequency synthesizer, and the VAT and VDT signal being also used in controlling the VCO.

And, Welland does not disclose the control voltage from the frequency synthesizer is used to control the receive amplifier or the receive mixer.

Therefore, both Kim and Welland do not disclose that one of the receive amplifier, the receive mixer, the transmit mixer and the transmit amplifier is controlled by only the VDT signal or both the VDT signal and the VAT signal from the frequency synthesizer, the VDT signal and the VAT signal being used to control the oscillator

Further, since the present invention has unexpected advantages as stated above, it is not obvious to one of ordinary skills to modify the PLL of Kim to include the frequency synthesizer as disclosed by Welland et al.

And, claims 3, 8, 22, 24 and 26 are also allowable in the reasons for claim 1.

Accordingly, it is believed that the pending claims of the present invention satisfies the conditions of allowance, and withdrawal of the rejection of the claims appears to be warranted, and the same is also respectfully requested.

For the reasons set forth above, the applicants respectfully submit that claims 1, 3, 8, and 21-26 now pending in this application, are in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

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APPENDIX OF ATTACHMENTS

Replacement Sheets of FIGS. 1-3, 7-10 and 11-13
(a total of 3 drawing sheets)

and

Annotated Sheets Showing Changes of FIGS. 1-3, 7-10 and 11-13
(a total of 3 drawing sheets)